

Redescription and life history of *Anchinia cristalis* (Lepidoptera, Gelechioidea), a poorly known moth in Japan, and a historical review on the family-group placement of the genus *Anchinia*

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Abstract *Anchinia cristalis* (Scopoli, 1763), a poorly known moth in Japan, is redescribed on the basis of specimens reared from larvae on leaves of *Daphne jezoensis* Maxim. (Thymelaeaceae) in Hokkaidô, northern part of Japan. Information on its larval and pupal habit is given on the basis of observations on the Hokkaidô population, throwing a doubt on previous reports. Proposals on the family-group placement of the genus *Anchinia* that were suggested in the past 30 years are reviewed and compared with each other. The proposal of Leraut (1997), placing *Anchinia* in the subfamily Hypercalliinae of the Oecophoridae *sensu lato*, is regarded as the most reasonable one at present.

Key words *Anchinia cristalis* (Scopoli, 1763), larval and pupal habit, exposed pupa, family-group placement, *Hypertropha*, *Amphisbatis*, *Hypercallia*, *Daphne jezoensis*.

The genus *Anchinia* Hübner, 1825 (type species: *Tinea verrucella* [Denis & Schiffermüller], 1775, a junior subjective synonym of *Phalaena cristalis* Scopoli, 1763) is represented by seven species: six are distributed in the Palaearctic region and one in the Oriental region (Meyrick, 1922; Gaede, 1938; Clarke, 1963; Lvovsky, 1996, 1999, 2003). Among the Palaearctic members, only *Anchinia cristalis* (Scopoli, 1763) has been recorded in the Far East (Lvovsky, 2003). So far as is known, foodplants of this genus belong exclusively to the genus *Daphne* (Thymelaeaceae) (Lvovsky, 1986).

Literature sources showed that there have been many proposals on the family-group placement of the genus *Anchinia*. These proposals can be divided into three categories, each very different from the others, and a further assessment seemed to be required for each proposal.

Recently, a number of gelechioid moths were collected and reared from larvae feeding on leaves of *Daphne jezoensis* Maxim. in Hokkaidô, northern part of Japan. The immature stages were observed until the moths emerged. The moths were identified as *Anchinia cristalis*. In Japan, this species was previously represented by a record from Kunashir (Lvovsky, 1990, 2003) and has been very little studied.

In the present paper, *Anchinia cristalis* is redescribed on the basis of the specimens bred from Hokkaidô, with observations on its larval and pupal habit. Then, after a review of recent proposals on the systematic position of the genus *Anchinia*, the genus is placed in the subfamily Hypercalliinae of the family Oecophoridae *sensu lato*. In addition, a new

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homonymy of the generic name *Anchinia* is referred to.

Authorship is as follows: the redescription of the morphology and generic homonymy are due to Jinbo largely and to Sugisima partly; the review and consideration of the systematic position of the genus is due to Sugisima largely and to Jinbo partly; the observations on the larval and pupal habit are due to Kogi.

***Anchinia cristalis* (Scopoli, 1763) (Figs 1–7)**

Phalaena cristalis Scopoli, 1763, *Ent. Carniol.*: 241, nr 611.

Anchinia cristalis: Gaede, 1938: 103; Lvovsky, 1981: 595, fig. 554: 1, 2; Lvovsky, 1986: 75; Lvovsky in Karsholt & Razowski, 1996: 101; Hannemann, 1997: 116; Parenti, 2000: pl. 79: 5; Lvovsky, 2003: 219.

Anchinia cristalis kuriliensis Lvovsky, 1990: 642; Lvovsky, 1999: 56, fig. 18: 1, 5.

Tinea verrucella [Denis & Schiffermüller], 1775, *Ankündigung syst. Werkes Schmett. Wienergegend*: 138.

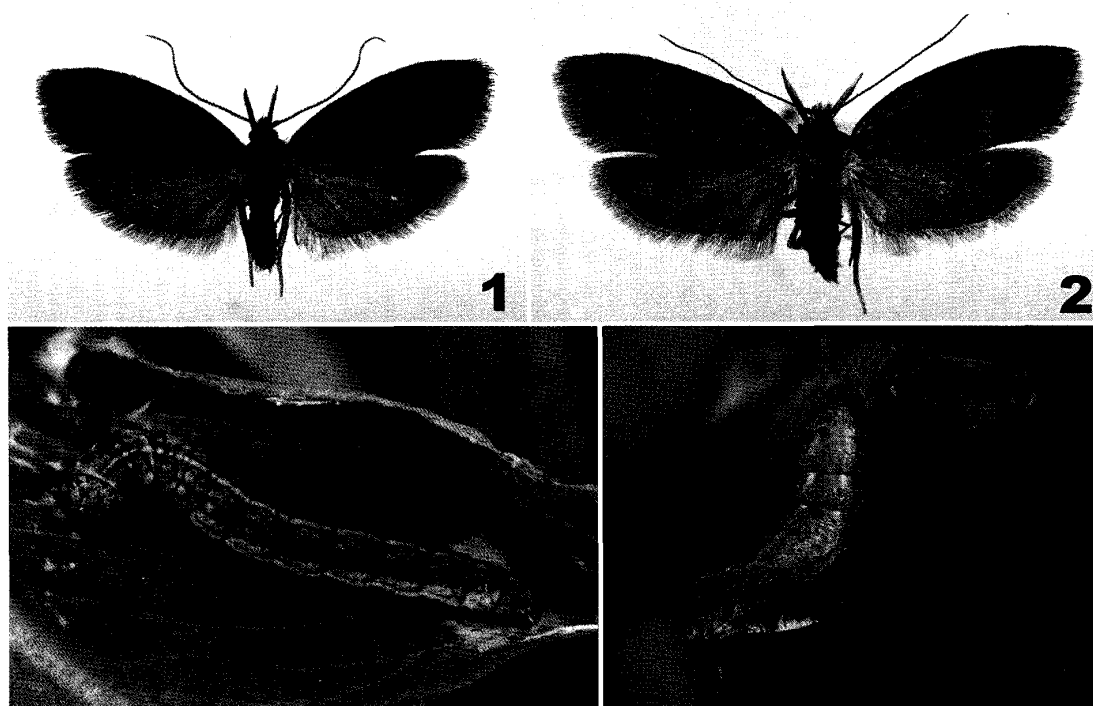
Anchinia verucella [sic!]: Hübner, 1825, *Verz. bekannt. Schmett.*: 409.

Anchinia verucella: Meyrick, 1922: 63.

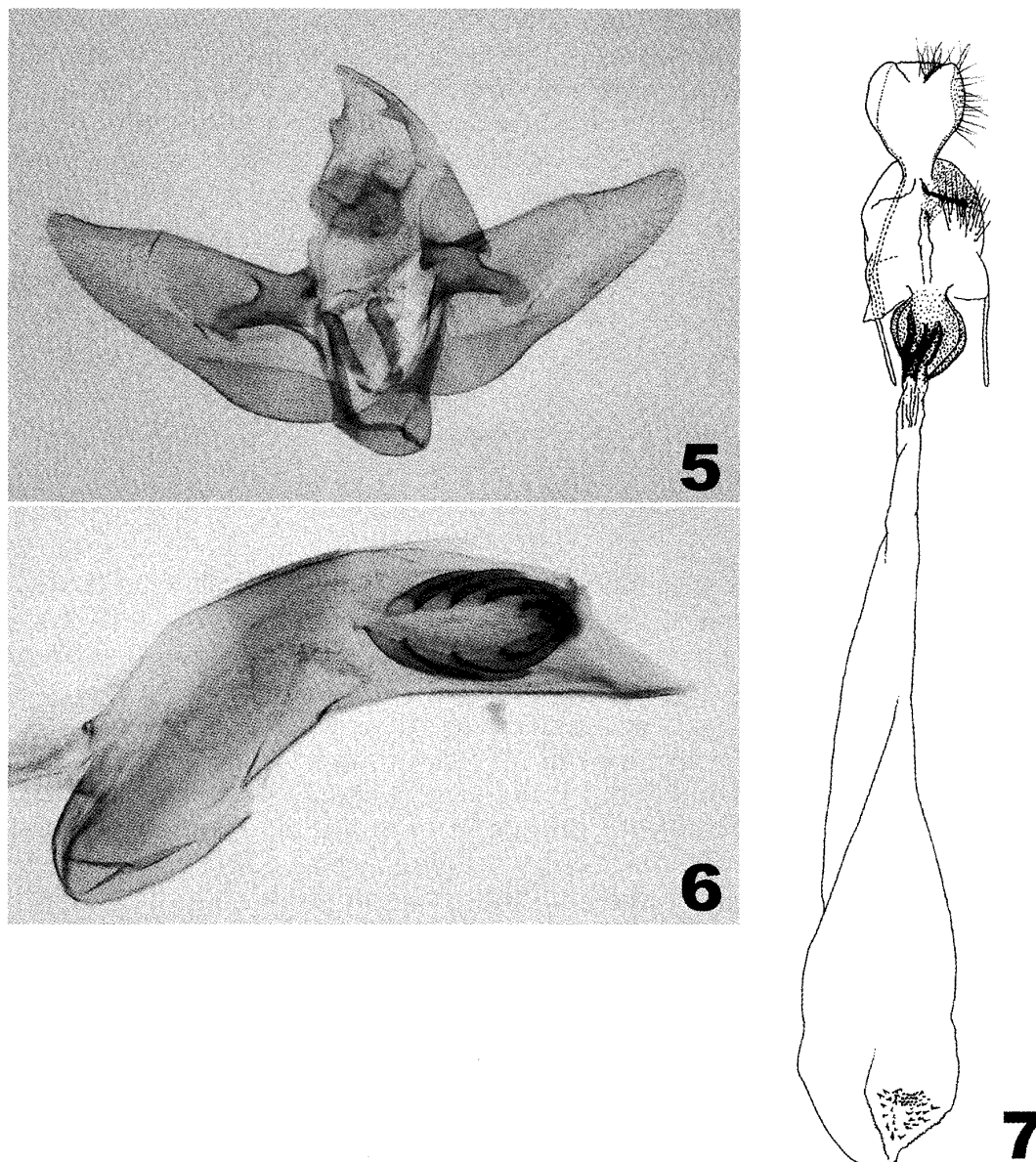
Tinea hepaticella Hübner, 1796, *Samml. Eur. Schmett.* 2: pl.12, fig. 84.

Tinea cneorella Hübner, 1813, *Samml. Eur. Schmett.* 8: pl. 46, fig. 315.

Redescription. Male and female (Figs 1–2). Forewing length 7.5–8.6 mm in male, 9.2–10.0 mm in female. Head grey-ochreous. Antenna finely ciliate, with each segment ochreous in distal half, fuscous basally. Labial palpi grey-ochreous, mottled with brownish scales ventrally near base of the third segment; the second segment very long, somewhat compressed laterally towards apex; the third segment 1/4 as long as the second, recurved. Thorax and tegula purple-brownish, tinged with red-brown caudally. Legs ochreous, dorsally darker. Abdomen grey-brownish. Forewing broad, approximately 1/3 as wide as long, with costal margin smoothly arched; ground colour purple-greyish, in basal 1/5 red-brownish; two whitish streaks extending from costal 2/5 and 3/5, obliquely outwards, reaching 1/3 of the wing width; on the wing axis two blackish patches on basal 1/3 and 2/3, the basal one larger and surrounded by reddish-brown scales; an indistinct streak extending



Figs 1–4. *Anchinia cristalis* (Scopoli). 1. Male. 2. Female. 3. Larva. 4. Pupa.



Figs 5-7. Genitalia of *Anchinia cristalis*. 5. Male genitalia in caudal view, with valvae expanded; aedeagus removed. 6. Aedeagus lateral view. 7. Female genitalia in ventral view.

from basal 2/3 of dorsal margin towards the distal one of the blackish patches; in female the wing broader and rounder, with whitish streaks wider.

Male genitalia (Figs 5-6). Uncus triangular, fused with tegumen, with a pair of strongly sclerotised triangular projections around the middle of its length on the margin, which may possibly be interpreted as the socii. Gnathos knob elliptical, 2/3 as long as wide, nearly as wide as tegumen. Tegumen laterally cleft just cephalically to the base of the gnathos. Valva subtriangular, with a hook-like process arising from the dorso-cephalic angle and reaching 2/3 of valval width; sacculus 1/2 as long as the whole valva. Juxta represented by a pair of somewhat spatulate plates. Aedeagus thick, somewhat curved ventrally, apically obliquely truncate, with pointed apex; vesica ornamented with numerous fine spines; cornuti represented by two arched rows of large thorns, four or five in each row.

Female genitalia (Fig. 7). Apophyses posteriores $3/2$ as long as apophyses anteriores. The eighth segment moderately sclerotised, with long setae sparsely distributed in caudal half; the sternite medially concave and membranous; ostium situated near the cephalic end of the sternite. Antrum rather large, ovate, well sclerotized, funnel-shaped towards colliculum. Colliculum well-defined, narrow. Membranous portion of ductus bursae straight, gradually broadened towards corpus bursae. Corpus bursae elongate; signum semicircular, ornamented with numerous spines.

Specimens examined. All specimens were reared from larvae feeding on leaves of *Daphne jezoensis* by H. Kogi in Hokkaidô. 3 ♂ 4 ♀, Irika, Shakotan-chô, em. 15–19. V. 2002; 1 ♂, Kamishibun, Iwamizawa-shi, em. 30. V. 2001; 1 ♂, Shizukawa, Tomakomai-shi, em. 7. VI. 2001.

Distribution. Transpalaeartic (Lvovsky, 1996, 2003).

Foodplants. *Daphne kamtschatica*, *D. mezereum* (Lvovsky, 1986); *D. jezoensis* (Thymelaeaceae).

Biology. On 27 April 2002, at Irika, Shakotan, Hokkaidô, approximately ten larvae were collected. They were at that time about five millimetres in length and rolled three or four terminal leaves of the foodplant longitudinally. On 4 May, a larva was full-fed (27 mm in length) and pupated. The larva (Fig. 3) is greyish-green and ornamented with a dorsal and a pair of lateral whitish lines, and each segment has three black dots on each end, two subdorsal and the remaining one anterolateral. Prothorax has a pair of large blackish eye-like blotches. The larva is nocturnal, hides in the leaf-roll during the daytime, and feeds on the leaves outside the leaf-roll at night. Excrement is pushed out of the roll. The larva pupates on the twig or on the wall of the rearing container, hanging from the surface by the caudal end attached to the surface, without constructing a cocoon. The pupa (Fig. 4) is brownish, dorsally recurved, with the head projecting anteriorly like a beak. Its head and thorax including the wings are ornamented with ridges and tubercles. No silk-covering is recognised over the pupa so that the pupa is exposed. It always hangs from the surface and never stands on it. Literature sources states that the pupa of *Anchinia* stands (*e. g.* Minet, 1990: Fig. 1), but they appear to be erroneous or at least misleading.

Remarks. Lvovsky (1990) described *A. cristalis kuriliensis* on the basis of the Far Eastern specimens, but in the later work (2003) he made no mention of the subspecies. The geographic variation of *A. cristalis* should be reconsidered in future. Lvovsky (1986) reported this species from *Daphne kamtschatica* in the Russian Far East. It is highly possible that this species will be found in other localities in Japan when larvae feeding on *Daphne* plants are investigated vigorously.

New homonym of the genus *Anchinia*

Besides the lepidopterous genus *Anchinia* Hübner, 1825, the name *Anchinia* has been applied also to another genus-group taxon, *i. e.* *Anchinia* Rathke, 1835 (Doliolidae, Doliola, Thaliacea, Urochordata, Chordata). The lepidopterous name *Anchinia* is the older, and according to “the law of precedence” the Chordata name should be replaced by another one. This homonymy was not treated in the catalogue of the lepidopterous generic names by Nye & Fletcher (1991).

Family-group placement of the genus *Anchinia* (Table 1)

Before 1970, the genus *Anchinia* was generally placed in the family Oecophoridae *sensu*

Table 1. Historical review of the family group placement of the genus *Anchinia* and the characters on the basis of which the authors placed the genus in the family group taxon. Hodges (1998) did not refer to the position of the genus *Anchinia* or related genera.

author	taxon where <i>Anchinia</i> was placed	characters
Lvovsky (1974)	Oecophoridae, Depressariinae, Amphisbatini	unspecified
Lvovsky (1986)	Amphisbatidae	lack of more suitable family group taxa (stating that <i>Anchinia</i> seems far from <i>Amphisbatis</i>)
Minet (1990)	Elachistidae, Hypertrophinae	pupal apomorphies: 'standing' pupa without cocoon or a silk-girdle
Leraut (1993)	Elachistidae, Hypertrophinae, Hypercalliini	pupal apomorphies used in Minet (1990) and the structures of the adult abdominal base
Fetz (1994)	Oecophoridae, Anchiniinae	larval characters including chaetotaxy
Lvovsky (1996)	Amphisbatidae, Hypercalliini	unspecified
Leraut (1997)	Oecophoridae, Hypercalliinae	unspecified
Lvovsky (1999)	Oecophoridae, Amphisbatinae	unspecified
Hodges (1998)	———	———

lato (e. g. Toll, 1964), which was a heterogeneous group of broad-winged gelechioids. Since the mid-1970's, various family-group systems within the superfamily Gelechioidea have appeared (e. g. Hodges, 1978, 1998; Lvovsky, 1986; Common, 1990; Minet, 1990; Sinev, 1992), and many proposals on the family-group placement of the genus *Anchinia* have been suggested (Table 1). The proposals varied greatly, but can be classified into three categories: 1) *Anchinia* should be placed in the family-group taxon based on the Australian genus *Hypertropha*; 2) *Anchinia* should be included in the taxon based on the Palearctic genus *Amphisbatis*; 3) without regard to the positions of *Hypertropha* and *Amphisbatis*, a compact family-group taxon should be established for *Anchinia* and its reliably close allies such as *Hypercallia*. In the paragraphs below, these proposals on the family-group placement of the *Anchinia* suggested by authors after the mid-1970's are reviewed.

The first view that *Anchinia* should be placed in the family-group taxon with *Hypertropha* as the type genus originated with Minet (1990). He placed *Anchinia* in the subfamily Hypertrophinae of the family Elachistidae. He extended these two family group taxa and redefined each as follows: Elachistidae as gelechioids with lateral condyles in pupal abdominal segments, and Hypertrophinae as elachistids sharing an exposed pupa and standing obliquely or uprightly. He considered the pupal habit of *Anchinia*, namely the pupa being exposed and attached to the surface by its abdominal end only, to be a derived character homologous with that of *Hypertropha* and placed *Anchinia* in his Hypertrophinae of Elachistidae. In addition, he stated that, within his Hypertrophinae, *Anchinia* and *Hypercallia* were possibly sister genera on the basis of a few derived characters in larval setae and pupal mouthparts. However, *Anchinia* and *Hypercallia* have no abdominal condyles, one of the diagnoses of his Elachistidae, while *Hypertropha* does have them. He placed *Amphisbatis* in the subfamily Amphisbatinae of the family Coleophoridae, which he regarded as being only distantly related to Elachistidae. This means that he considered *Anchinia* to be far from *Amphisbatis*. Leraut (1993) accepted the system of Minet (1990) in broad outline and established within the subfamily Hypertrophinae of Minet (1990) three tribes, Hypertrophini, Tonicini, and Hypercalliini, on the basis of the structures of the adult abdominal base; he placed *Anchinia*, *Hypercallia*, and other four genera in Hypercalliini.

The second view, that *Anchinia* should be placed in the family-group taxon with

Amphisbatis as the type genus originated with Lvovsky (1974). In spite of repeatedly changing the rank of the taxon, he constantly included *Anchinia* in the family-group taxon based on *Amphisbatis*: Amphisbatini, Depressariinae, Oecophoridae (1974); Amphisbatinae, Oecophoridae (1986, 1999); Hypercalliini, Amphisbatidae (1996). In his paper of 1986, he stated that *Anchinia* was rather different from *Amphisbatis* in some respects, and that his family-group placement of *Anchinia* was due to there being no other taxa more suitable for receiving the genus; otherwise he did not refer to the reason for his treatments.

Leraut (1997) transferred Hypercalliini *sensu* Leraut (1993) from Hypertrophinae of Elachistidae to Oecophoridae *sensu lato*, giving them subfamily rank. This change was executed in a checklist and no reason was specified.

The last view originated with Fetz (1994), who rearranged subfamilies within the family Oecophoridae *sensu lato* on examination of the larval morphologies. He recognised *Anchinia* and *Hypercallia* to be sister-genera and established only for these two genera the subfamily Anchiniinae. At the same time, he assigned *Amphisbatis* to the distinct subfamily Amphisbatinae, and thus he did not support a close relationship between *Anchinia* and *Amphisbatis*. He neither examined nor referred to *Hypertropha*. Anchiniinae is composed of *Anchinia* and *Hypercallia*, and therefore it is a junior synonym of Hypercalliini Leraut, 1993 (see Leraut, 1997). Below, however, we use Anchiniinae binding between quotation marks for convenience sake.

Currently most authors studying the Gelechioidea accept the system of Hodges (1998). However, nothing can be detected on the family-group placement of *Anchinia* from his work, because he refers neither to *Anchinia*, *Hypercallia*, Hypercalliinae, nor Anchiniinae.

As reviewed above, the family-group placement of the genus *Anchinia* and allied genera varied much among authors. However, the monophyly of *Anchinia* and *Hypercallia* (here referred to as the clade *A-H*), or that of Hypercalliini *sensu* Leraut (1993) is supported reliably by several derived characters (Minet, 1990; Leraut, 1993; Fetz, 1994). Therefore it may be fairly reasonable to adopt a family group taxon such as Hypercalliini *sensu* Leraut (1993) or 'Anchiniinae' *sensu* Fetz (1994), as a nominal one for placing the clade *A-H*.

Given that the monophyly of the clade *A-H* was adopted, the next problem of concern is which of the type genera of the nominal family group taxa is closest to the clade *A-H*. Up to the present, only two genera, *Hypertropha* and *Amphisbatis*, have been proposed as the candidates. The view that the clade *A-H* is close to *Hypertropha* is based on the exposed and standing pupa, and on this basis Minet (1990) placed *Anchinia* in Hypertrophinae of Elachistidae. However, Kogi has revealed that the pupa of *Anchinia cristalis* always hungs from the surface instead of standing (Fig. 4). This throws a doubt on the homology of the pupal characters in *Anchinia* and *Hypertropha*. In addition, *Anchinia* is unsuitable for Elachistidae *sensu* Minet (1990) because of the absence of condyles in the pupal abdomen. Minet (1990) expected that the condyles would have been lost secondarily in *Anchinia* probably owing to the pupal habit for camouflage, which must require the change of its direction in response to the course of the sun. During observations of three bred series of *A. cristalis*, Kogi did not see the habit expected by Minet (1990). Consequently, there is no good reason to believe that *Anchinia* should be included in the taxon based on *Hypertropha* or even in Elachistidae. The view that *Anchinia* should be placed in the taxon based on *Amphisbatis* has been adopted mainly by Lvovsky (1974, 1986, 1996, 1999), but this view is not satisfactory as he (1986) stated that his placement was only tentative.

At present, it does not seem reasonable to regard *Anchinia* as being remarkably close to any

gelechioid taxa except for *Hypercallia* or at most those placed in Hypercalliini *sensu* Leraut (1993). A cladistic analysis using the taxa throughout the superfamily would be able to find the logically suitable position for *Anchinia*, but such a comprehensive analysis is beyond the scope of the present study. For the purpose of implying both the relatively reliable affinity of *Anchinia* with *Hypercallia* or with the genera placed in Hypercalliini of Leraut (1993) and its uncertain affinities with other gelechioids, it will probably be best to adopt the view of Leraut (1997) that *Anchinia* is placed in the subfamily Hypercalliinae of the family Oecophoridae *sensu lato*. Oecophoridae *sensu lato* has for a long time served substantially as a "waste basket" within Gelechioidea, and has been regarded as a receptacle for taxa which require further critical taxonomic examination. Assigning Hypercalliinae including *Anchinia* to this notoriously heterogeneous family will avoid *Anchinia* or allied genera from being overlooked in the re-assessment of the family-group taxa in Gelechioidea. For the same reason for which we choose Hypercalliinae to receive *Anchinia*, it might be equally wise to recognise 'Anchiniinae' just for *Anchinia* and *Hypercallia* in Oecophoridae *sensu lato*, as Fetz (1994) did. On one hand, the monophyly of 'Anchiniinae' is more reliable than that of Hypercalliinae, because the latter taxon is based on the structures of the abdominal bases, which are sometimes homoplastic. On the other hand, Hypercalliinae is applicable to world fauna and 'Anchiniinae' only to European fauna. We here give priority to the application range over strict monophyly and do not recognise 'Anchiniinae'.

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摘 要

日本であまり知られていないナニワズハリキバガ (鱗翅目, キバガ上科) の再記載と生活史およびハリキバガ属の科階級群の所属に関する総説 (神保宇嗣・杉島一広・小木広行)

日本でこれまであまり知られていなかったナニワズハリキバガ (新称) *Anchinia cristalis* (Scopoli, 1763) を北海道本土から記録し, 幼虫期および蛹期の習性ととも再記載した. 日本のキバガ上科には類似した種はおらず同定は容易である. 今回, 4月に本種の幼虫がジンチョウゲ科のナニワズ *Daphne jezoensis* の先端の葉数枚を綴ったシュルター内に見出された. 幼虫は夜行性で, シュルター外で葉を食害する. 蛹化は枝や壁面に尾端で懸垂した状態で行われ, 繭が構築されないために蛹が裸出する. 蛹はタテハチョウ科で知られる垂蛹に近い. 成虫は5–6月に羽化した. 国外での食餌植物としては, 同じくジンチョウゲ科のヨウシュジンチョウゲ *Daphne mezereum* およびカラフトナニワズ *Daphne kamtschatica* の記録がある. 本種には極東亜種 *A. cristalis kuriliensis* Lvovsky, 1990が記載されているが, この扱いおよび北海道集団の所属は今後の課題である. *Anchinia* 属は旧北区から5種, 東洋区から1種が知られるが, 極東からは本種のみが記録されていた. 知られている限りでは, 本属の種はすべてジンチョウゲ科の *Daphne* 属を寄主とする. また, 原索動物サルバ綱の属 *Anchinia* Rathke, 1835の存在に気づいたが, ナニワズハリキバガの属 *Anchinia* Hübner, 1825のほうが先行するので原索動物のほうが新参同名となる.

Anchinia の科階級群の所属に関して, 1970年代中期以降様々な提案がなされてきた. それらは大きく分けて三通りに分類される. すなわち, *Hypertrophia* を模式属とする科階級群にハリキバガ属を含めるとする第一の処置, *Amphisbatis* を模式属とする科階級群に含めるとする第二の処置, そしてハリキバガ属を含むたかだか6属からなる単系統性の高い亜科ないし族 (模式属はハリキバガ属あるいはそれに最も近縁と推定される *Hypercallia*) を設けるという第三の処置である. 第一の処置の根拠は, 蛹が裸出し起立するという習性が *Hypertrophia* とハリキバガ属に共通するというものである. しかし, 本研究での観察により, ハリキバガ属の蛹が起立するのではなく懸垂することが明らかにされたため, この処置の妥当性は疑問視せざるを得ない. 第二の処置は, ハリキバガ属と *Amphisbatis* の間に

顕著な差違があるにしても、より適した群が見あたらないから、という消極的な理由によるものである。この処置は、ハリキバガ属と *Amphisbatis* が近縁であるとの誤解につながる恐れがあるために採用しがたい。それに対して、三つ目の処置は、その亜科あるいは族の単系統性を支持する形質が複数示されており、さらに先の二つの提案をした著者であっても、その群の近縁性は支持している。従って、この処置を採用し Hypercalliinae を認めることは妥当であろう。しかしながら、この亜科に近縁な分類群は特定されていない。ハリキバガ亜科の強く支持された単系統性と、それに近縁な分類群が未知であることを同時に示すため、本報では Leraut (1997) の案を採用し、ハリキバガ属を広義マルハキバガ科の亜科 Hypercalliinae (ハリキバガ亜科: 新称) の一員として扱うこととした。マルハキバガ科は多系統的な分類群であることを前提とした “waste basket” として機能してきたので、ハリキバガ亜科が他の特定の群に近縁であると誤解される可能性は低く、また将来キバガ上科の科階級群の再編が行われる際にハリキバガ亜科が見逃されることも避けられるであろう。

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